

5. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

5.1 PRODUCTION

Diazinon is the Ciba-Geigy Corporation trademark name for the active ingredient O,O-diethyl-O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate. This organophosphorus insecticide is produced commercially by reacting 2-isopropyl-4-hydroxy-6-methylpyrimidine and O,O-diethyl phosphorochloridothioate (HSDB 2006). It is also produced by condensation of isobutyramidine with acetoacetate to yield the intermediate, 2-isopropyl-4-methylpyrimidine, which is transformed to diazinon by treatment with diethylthiophosphate acid (Müller et al. 2005). Ciba-Geigy Corporation produced this chemical in McIntosh, Alabama until 1994 (SRI 1994, 1995). Currently, diazinon is produced by Drexel Chemical Company in Cordele, Georgia (SRI 2005).

In 1990, 4.67 million kg of diazinon were produced in the United States (Larkin and Tjeerdema 2000). No more recent production estimates for diazinon are available. As with many toxic chemicals, especially those whose production or use involves proprietary information, quantitative estimates of production are virtually impossible to obtain (Bason and Colborn 1992). As of June 30, 2001, manufacturing of indoor use products containing diazinon was discontinued. Manufacture of non-agricultural outdoor use products containing diazinon was discontinued as of June 30, 2003 (EPA 2004c). Production amounts of diazinon would be expected to decrease due to the discontinuation of all residential products containing this chemical.

Beginning on January 1, 1995, diazinon was listed as one of the newly added chemicals that manufacturing and processing facilities would be required to report under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Larkin and Tjeerdema 2000). Table 5-1 lists the production year, number of facilities, the state where each facility is located, and the range (in pounds) for each domestic manufacturer that reported the production or formulation of diazinon in 2004 (TRI04 2006). Manufacturers are required to report Toxics Release Inventory (TRI) data to satisfy EPA requirements. The TRI data should be used with caution since only certain types of facilities are required to report (EPA 2005). This is not an exhaustive list.

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Table 5-1. Facilities that Produce, Process, or Use Diazinon

State ^a	Number of facilities	Minimum amount on site in pounds ^b	Maximum amount on site in pounds ^b	Activities and uses ^c
AL	6	100,000	9,999,999	1, 3, 4, 7, 9
AR	3	1,000	99,999	9, 12
CA	2	10,000	99,999	7
CO	2	10,000	999,999	7
FL	1	100,000	999,999	7
GA	7	1,000	9,999,999	2, 3, 4, 7, 9
IA	1	100,000	999,999	7
IL	1	1,000	9,999	12
KS	2	1,000	99,999	7, 8
LA	3	1,000	999,999	12
MO	5	1,000	9,999,999	7, 9
NE	1	10,000	99,999	12
NY	1	1,000	9,999	7
OH	7	100	9,999,999	7, 8, 12
TN	2	1,000	99,999	7, 12
TX	6	1,000	999,999	7, 9, 12
UT	1	10,000	99,999	12
WI	2	1,000	99,999	7

^aPost office state abbreviations used

^bAmounts on site reported by facilities in each state

^cActivities/Uses:

- | | | |
|--------------------------|--------------------------|-----------------------------|
| 1. Produce | 6. Impurity | 11. Chemical Processing Aid |
| 2. Import | 7. Reactant | 12. Manufacturing Aid |
| 3. Onsite use/processing | 8. Formulation Component | 13. Ancillary/Other Uses |
| 4. Sale/Distribution | 9. Article Component | 14. Process Impurity |
| 5. Byproduct | 10. Repackaging | |

Source: TRI04 2006 (Data are from 2004)

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5.2 IMPORT/EXPORT

Official government statistics on imports and exports for chemicals such as diazinon are summarized under broad generic categories such as “pesticides” or “organophosphates.” In 1982, estimated diazinon imports to the United States were 6.41×10^4 kg (141,000 pounds) (HSDB 2006). No recent estimates are available on the volume of diazinon imported into the United States. Data on past and/or current import volumes are not adequate to assess trends in import volumes of this pesticide.

The U.S. EPA has no mandate to collect comprehensive data on pesticide exports, and does not have permission from the Department of Commerce to access the information in export declarations (Smith 2001). In a report by the Foundation for the Advancement of Science and Education, the authors report that no government agency maintains current records concerning what specific pesticides are exported by the United States. Between 1992 and 1994, 1.1 billion pounds of pesticides were exported with their exact chemical name omitted from the shipping records. Of the 25% of all pesticide exports that could be identified to a specific chemical, these authors identified export volumes of diazinon for 1992, 1993, and 1994 of 4.7 million, 5.0 million, and 3.4 million pounds, respectively. The remaining 75% of all exported pesticides could not be identified to a specific chemical (FASE 1996). According to U.S. Customs records, the United States exported an estimated 5.8 million pounds of diazinon from 1997 to 2000 (Smith 2001).

5.3 USE

Diazinon is an organophosphate pesticide that was first registered for use in the United States in 1956 (EPA 2004c). It was first developed as an insecticide, acaricide, and nematocide for use on a variety of pests for control of soil insects and pests of fruit, vegetables, and forage and field crops (EPA 2004c). Diazinon is used on ranges, pastures, grasslands, and ornamentals. It is used on grubs and nematodes in turf, in seed treatment, and in fly control (Meister et al. 2006). It is also used against flies in greenhouses and mushroom houses. Other uses include applications as a topically applied pesticide agent (e.g., aerosols, sprays, dips, ear tags) on non-lactating livestock to control biting insects or skin parasites (EPA 2004c; Wester et al. 1993; Worthing and Walker 1983).

With the steady elimination of older organochlorine pesticides from the market, diazinon has replaced many of the organochlorine pesticides such as chlordane. In addition to applications in agriculture,

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diazinon has been heavily used in urban areas (Banks et al. 2005). It had been used extensively in home and garden applications, in formulations designed to prevent such pests as crickets or cockroaches from infesting homes or offices, and in pet collars (EPA 2004c). Residential application methods included aerosol cans, spray equipment, and granular spreaders. Due to the emerging health and ecological risks posed by diazinon, manufacturers agreed to phase out and cancel all residential products. As a result, after December 31, 2004, no diazinon products with residential uses would be registered or sold (EPA 2004c). It was also formerly used on golf courses and large sod farms for control of grubs and nematodes in turf, but these uses were suspended in the 1980s, first in the United States and then in Canada, after deaths occurred in migratory waterfowl (Frank et al. 1991a; Kendall et al. 1993). More cancellations and restrictions to be implemented in the future include: cancellation of all granular registrations (with some exceptions), deletion of aerial application for all uses (with some exceptions), deletion of foliar application on all vegetable crops, application rate reduction for ornamentals and lettuce, establishment of crop specific reentry intervals (REIs), cancellation of all seed treatment uses, engineering controls for all uses, reduction of the number of applications per growing season, and cancellation of use on some crops (EPA 2004c). Various types of diazinon formulations are produced including dusts, emulsifiable concentrates, granules, impregnated materials, microencapsulated forms, liquid, pressurized sprays, soluble concentrates, flowable concentrates, ready-to-use solutions, seed dressings, and wettable powders (EPA 2004c).

The total agricultural use of diazinon was estimated as 1.05 million pounds in 1992 (USGS 1992). It was estimated that up to 35.2% of the diazinon applied in the United States in 1992 was for non-agricultural uses, 19.9% was used on almonds, 9.5% on plums, 8.4% on peaches, 4.6% on walnuts, 4.5% on lettuce, 4.2% on nectarines, 4.2% on sweet corn, 3.4% on tobacco, 3.2% on apples, and 2.9% on all citrus (USGS 1992). From 1987 through 1997, total annual domestic usage of diazinon was over 13 million pounds. However, most of this (about 70%) was allocated to outdoor residential uses (EPA 2004c). Since residential uses of diazinon have been discontinued, the total annual usage would be expected to be significantly lower. Approximately 4 million pounds of active ingredient diazinon are used annually on agricultural sites (EPA 2004c). According to data from the Department of Pesticide Regulation's Pesticide Use Reports, the reported amount of diazinon used for both agricultural and reportable non-agricultural applications in California each year from 2000 to 2004 was 1,057,845; 1,001,294; 690,590; 523,786; and 492,050 pounds, respectively (California Environmental Protection Agency 2006).

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5.4 DISPOSAL

Diazinon is currently considered a toxic chemical under Section 313 of the Emergency Planning and Community Right-To-Know Act (EPA 1995a, 1995b). Disposal of wastes containing diazinon is controlled by a number of federal regulations (see Chapter 8).

For ultimate disposal, large amounts of diazinon residuals should be incinerated in a unit with effluent gas scrubbing, while physical, chemical, and biological treatments may be appropriate for disposal of smaller quantities of diazinon. Two types of physical treatment systems, which have been tested and employed for pesticide wastes, are lined evaporation/degradation beds and granular activated sorption systems. Chemical treatment methods for pesticide waste degradation include photolysis, hydrolysis, and oxidation. Diazinon hydrolysis using sodium perborate and copper (+2) catalyst have been used (Felost et al. 2003).

Composting has been used for the disposal of diazinon-contaminated soils and organic solids. Diazinon was reported to undergo nearly complete degradation during composting of dairy manure. Complete degradation was also observed to occur within 4 weeks after application to turf and 6 weeks during composting of grass clippings (Felost et al. 2003).

Currently, empty pesticide containers should be triple rinsed with water and then transferred to a proper hazardous waste disposal facility. On February 11, 1994, the EPA proposed container design requirements for nonrefillable and refillable pesticide containers. This FIFRA authorized action also includes standards on pesticide removal from containers before disposal, standards for containment of bulk pesticide containers, and procedures for container refilling operations (26 FR 6712 "Standards for Pesticide Containers and Containment") (EPA 1994a).

No information was found on the past and present volumes of diazinon or diazinon-contaminated wastes disposed of by each disposal method.